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BIOLOGICAL EVALUATION OF SARATOGA
SPITTLEBUG ON THE CHIPPEWA NATIONAL FOREST;
BASED ON 1969 SCAR-COUNT SURVEYS

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ABSTRACT

Saratoga spittlebug scar-count surveys on the Chippewa National Forest reveal one outbreak area on the Cass Lake Ranger District, and one heavily damaged plantation on the Blackduck Ranger District. The Forest Manager is advised to consider chemical suppression of the spittlebug. Ultra-low volume application of Malathion LV at 10 fl. oz. per acre from air is the recommended control method. Supplemental scar-count surveys are recommended for plantations in the vicinity of the detected outbreak area. Future survey needs are suggested for each plantation examined in 1969.

INTRODUCTION

The Saratoga spittlebug, Aphrophora saratogensis Fitch, is one of the major pests of young red pine plantations in the Lake States. The scars caused by adult feeding on pine branches are used to estimate the preceeding season's damage, and to estimate next year's spittlebug population. The scar-count surveys are made annually on selected susceptible red pine plantations. When an outbreak is detected, all the susceptible plantations in the vicinity of the outbreak are surveyed to determine if additional plantations are damaged. Then the Forest is advised to consider chemical suppression to prevent damage. Nymphal surveys in the spring are planned for the plantations proposed for control to confirm continuation of the outbreak.

BIOLOGICAL REVIEW

A. Causal Agent

The Saratoga spittlebug, Aphrophora saratogensis (Fitch)

B. Host

Red pine, Pinus resinosa Ait.

Alternate hosts are Comptonia sp., Rubus sp. and other woody shrubs. Other pines in the area may be attacked, but damage usually is not serious.

C. Type of Damage

The adult spittlebugs feed on 1-5 year old internodes of branches and the main stem. Necrotic areas, i.e. scars, are produced in the phloem, cambium and newly formed xylem as a result of the feeding. One season's accumulation of 35 or more scars per 4 linear inches of twig interferes with food and water translocation. At first, stunting of terminal growth occurs. Continued severe feeding in successive years results in branch and terminal die-back, i.e. flagging, and eventually, tree mortality. Thus, economic loss occurs from tree growth reduction, poor tree form and quality, and tree mortality (Ewan, 1961).

D. Ecological Considerations

The Saratoga spittlebug outbreaks are greatly affected by the tree host-alternate host ratio and climatic conditions (Ewan, 1961).

Spittlebug eggs overwinter under bud scales of red pine on the branches of the upper crown. The young nymphs, immediately after hatching from eggs in May, drop from the tree and migrate to herbaceous plants. When about 2 weeks old they move to woody shrubs, particularly sweet fern, Comptonia sp., and raspberries, Rubus sp. Indications are that local alternate host preferences do occur.

The spittlebug abundance is related to the host and alternate hosts available for oviposition, nymphal development and adult feeding. Generally, red pine plantations in the Lake States are susceptible to outbreak populations after the trees are 2 feet tall and until crown closure eliminates alternate hosts, i.e. tree height of about 14 feet with stocking at 1000 trees per acre. By causing tree stunting and mortality, unchecked spittlebug populations are able to maintain open red pine stands and thus prolong outbreak conditions. Other red pine pests, such as white grub, Scleroderma pine canker and defoliators may also produce conditions favorable to spittlebug outbreaks.

Weather is another ecological factor that can have adverse affects on spittlebug populations. Spittlebug nymphs are relatively protected at the root collar of the alternate host. However, late spring temperatures in low 20's may cause nymphal mortality. Also, the nymphs are readily susceptible to dessication during first migration from red pine to herbaceous plants and later to woody shrubs.

A few parasites and predators are reported for Saratoga spittlebug, but non effectively reduce outbreak populations.

SURVEY METHODS

Scar-count surveys are made to detect and evaluate Saratoga spittlebug outbreaks (Millers, 1968). Sample areas are selected systematically from a list of susceptible red pine plantations. An attempt is made to examine a plantation every 4 years, but more frequently when spittlebug build up is detected.

All the scar-counts on the Chippewa National Forest were made by District personnel during the first 2 weeks in October--according to instructions provided by the staff of the St. Paul Field Office (Millers and Erickson, 1969)..

About 20 samples are taken from each plantation. Each sample is a count of scars on a 4 inch long twig taken from the penultimate internode of an upper crown branch.

The scar-counts determine the severity of damage and, indirectly, the spittlebug populations. The following classification is used:

Light	- less than 20 scars/twig
Moderate	- 20-35 scars/twig
Heavy	- more than 35 scars/twig

When heavy damage is found in a portion of a plantation, the entire plantation is classified as heavy.

When spittlebug outbreak centers are detected from the selected plantation samples, a supplemental scar-count survey is recommended to delineate the outbreak boundaries.

SURVEY RESULTS AND DISCUSSION

The results of the scar-count survey are shown in Table I. The scar-count populations and the recommended action for each plantation is provided in the table. The Forest Manager is advised to consider the recommendations, and plan for future work.

Future surveys are recommended on the basis of scar-counts and tree heights. When the trees can outgrow spittlebug hazard before next survey, the plantation is dropped from future surveys. Plantations with poor stocking, or areas less than 10 acres are recommended to be dropped because of doubtful economic benefits.

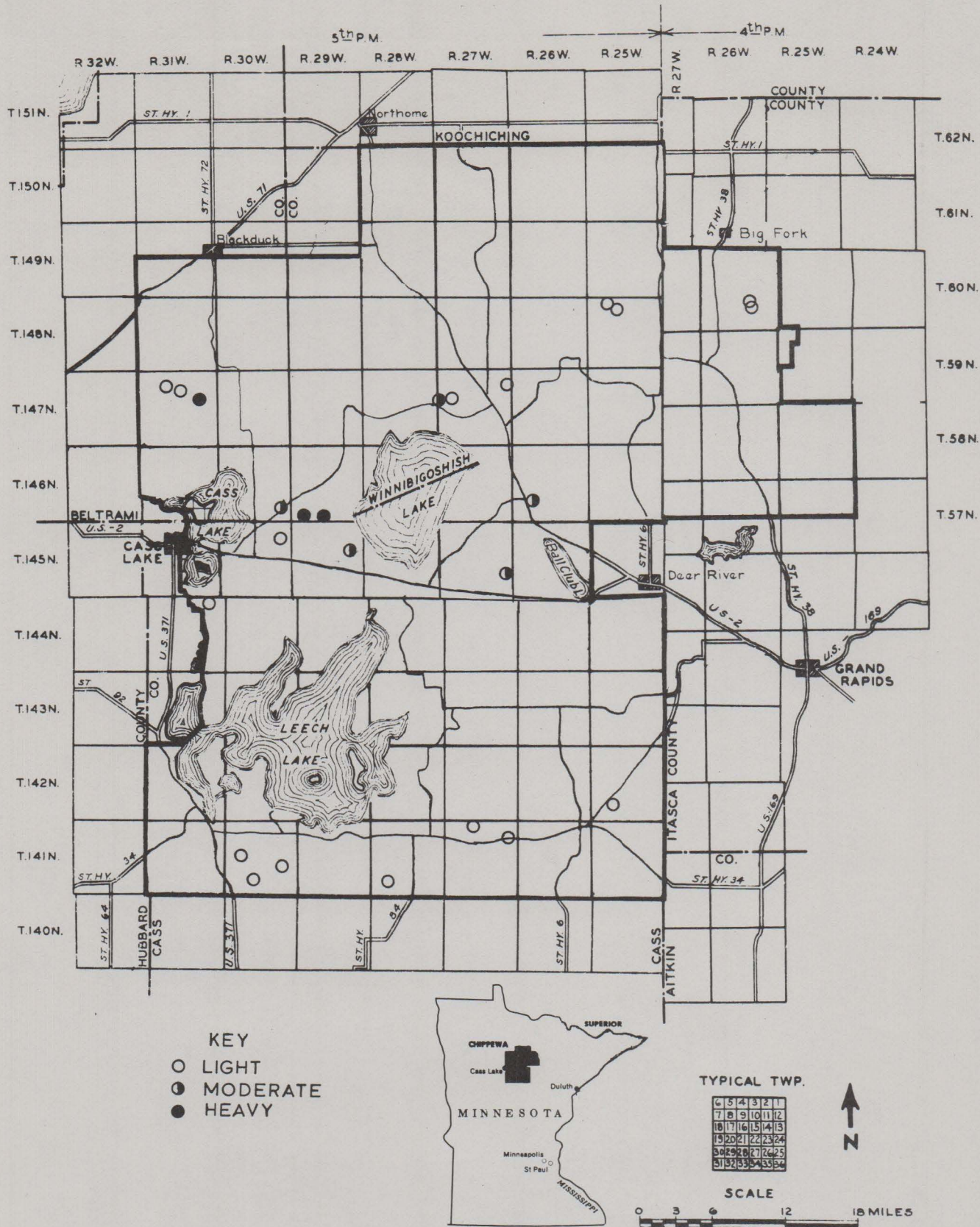
An outbreak area is apparent around the Winnibigoshish Lake (Map 1). On Cass Lake Ranger District, in the area between Cass Lake and Winnibigoshish Lake, 2 plantations have heavy damage. Around the Lake, 5 plantations have moderate scar-counts. North of Cass Lake, on the Blackduck Ranger District, is an isolated, heavily infested plantation.

TABLE I. RESULTS OF SARATOGA SPITTLEBUG SCAR-COUNT SURVEY - 1969 - CHIPPEWA NATIONAL FOREST

Plantation Location				Area	Trees		Survey Results	
District Id. No. 1/	T	R	S	Acres	T/A	Ht./Ft.	Scars	Recommendations
<u>Bena Ranger District</u>								
P-39e	144	29	3	15	0	---	-	Drop - Poor stocking
P-38b	145	26	19	11	900	15+	-	Drop - Trees too tall
P-39a	145	27	24	16	900	12	M	Scar-count - '70
P-37g	145	29	14	20	800	12	M	Scar-count - '70
P-38a	145	29	15,22	22	800	15+	-	Drop - Trees too tall
<u>Blackduck Ranger District</u>								
131/87-8/42	147N	31W	9	43	800	9	L	Drop - Trees too tall
87/132-2/18	147N	31W	10,15	34	450	7	L	Scar-count - '73
133-12,14	147N	31W	14,24	21	800	8	H	Nymph - '70 ^{2/}
137-14,16	147N	31W	2	14	800	8	M	Drop -
<u>Cass Lake Ranger District</u>								
P-167i	144N	31W	2	10	500	6	L	Scar-count - '71
P-168c	145N	30W	11,12	13	750	9	L	Scar-count - '72
P-170a	146N	29W	31,32	63	600	4	H	Nymphal - '70
P-167a	146N	29W	33,34	40	750	9	H	Nymphal - '70
P-170b	146N	30W	25,26	59	650	4	M	Scar-count - '71 or Nymphal
<u>Cut Foot Ranger District</u>								
153-27,20	146N	26W	20,29	119	800	9	M	Scar-count - '71
156-7,4,3								
88/89-16/15,16								
94-47								
83-17								
	147N	27W	12	54	750	6	L	Scar-count - '73
	147N	27W	17,18	87	800	6	L	Scar-count - '72
	147N	27W/28W	18/13,24	50	800	8	M	Scar-count - '71
<u>Marcell Ranger District</u>								
11-27	60N	26W	22	13	500	6	L	Scar-count - '73
16-30	60N	26W	22,27	12	600	6	L	Scar-count - '73
33-22,23,24,27	148N	25W	4,9	100	700	4	L	Scar-count - '71
34-20	148N	25W	5	19	900	8	L	Scar-count - '73
<u>Remer Ranger District</u>								
141,142-25k	141N	27W	4,5	8	700	15+	L	Drop - Trees too tall
145-25h	141N	27W	11,12	8	500	10	L	Drop - Trees too tall
99-25e	142N	25W	28,29	9	700	11	L	Drop - Trees too tall
<u>Walker Ranger District</u>								
53-1	141N	28W	10	190	600	4	-	Drop - No hazard
60-16	141N	28W	26	7	---	---	-	Drop - Poor stocking
57-44	141N	28W	29	35	1000	6	L	Drop - No hazard
83-7	141N	30W	17	12	600	12	L	Drop - Trees too tall
87-	141N	30W	28	31	800	15+	L	Drop - Trees too tall
84-13	141N	30W	23	13	800	13	L	Drop - Trees too tall
104-7	141N	31W	17	91	500	1-2	-	Drop - Trees too tall
11-1,2	142N	31W	17,18	18	900	15+	-	Scar-count - '72
								Drop - Trees too tall

1/ P - xxx = Plantation number
xxx - xx = compartment number - stand number

2/ Nymph + year = nymphal survey, if suppression is proposed; when suppression cannot be identified, drop the plantation from future surveys



Map 1. Saratoga spittlebug populations in red pine plantations on the Chippewa National Forest - 1969

Plantations with heavy damage from spittlebug can expect growth reduction and some flagging. Additional damage in 1970 will intensify flagging and some tree mortality may occur. Moderately damaged plantations may have some growth reduction and increased damage in 1970 can be expected.

The heavily infested plantations should be considered for insecticidal treatment to reduce the spittlebug population. If spraying is warranted, nymphal surveys should be requested to confirm the continuation of the outbreak into 1970.

The moderately infested plantations are not in immediate danger of tree mortality. However, when a spray project is planned in the vicinity, it may be more economical to treat the moderately infested plantations, provided the nymphal surveys indicate high populations.

All the red pine plantations around the Winnibigoshish Lake should be examined for spittlebug damage. Since a large number of plantations are present, the survey should be scheduled for fall of 1970. However, an immediate supplemental survey is recommended for several plantations adjacent to the heavily infested plantations (Table II).

Table II. Areas recommended for supplemental scar-counts - 1969

Cass Lake Ranger District

Plant No.	T	R	S	Acres
164e	146	29	34,35	30
164f	146	30	35	5
165a	146	29/30	31/36	40
165b	146	29	31	22
165c	146	29	31	55
170a	146	29	31,32	63
174a	146	29	31	30
174f	146	30	28,33	246
177c	146/145	29	33/4	131
			TOTAL	622

SUPPRESSION INFORMATION

Saratoga spittlebug is controlled with Malathion LV^R Concentrate applied from air at ultra-low volume at 10 fl. oz. per acre. The most recent suppression costs for marking, aircraft and insecticide and manpower have been about \$4.00 per acre (unknown, 1969).

Spraying is timed to kill the adult spittlebugs before they lay eggs. As a general rule, at least 90% of nymphs should have transformed into adults before treatment. Usually, spraying takes place in late July or early August.

Malathion is a relatively safe insecticide when applied at recommended rates. However, spraying of open waters should be avoided. Label warnings for handling must be observed. Malathion is toxic to bees, and beekeepers in the area should be informed before spraying. The LVC application is hazardous to acrylic paints, such as used by General Motors cars.

R - Registered by American Cyanamid Company; contains 95% tech. malathion.

RECOMMENDATIONS

1. The Forest Manager is advised to consider chemical suppression for Saratoga spittlebug on Cass Lake and Blackduck Ranger Districts.
2. Supplemental scar-count surveys are recommended for Cass Lake Ranger District to delineate the entire spittlebug outbreak.
3. All the Districts have recommendations for future surveys of their plantations that were surveyed in 1969. The Forest Manager should act on the recommendations.

LITERATURE CITED

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